

Applying Definitions

Applying Definitions to the Design

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Objectives

1. Make the participants aware of the significance of definitions.
2. Show the participants an example of how ignoring definitions can affect system operation.
3. Provide participants drawings to work through and apply definitions in order to determine compliance with the Ohio Plumbing Code.

Applying Definitions

Observations

- Designers, contractors and installers aren't using the building blocks of knowledge within the plumbing code.
- Often times we aren't even applying common scientific principles.

This presentation is in no way meant
to minimize or demoralize

I just want to....

OPEN

Your EYES !



Applying Definitions

Two problems presented by contractors during the last 6 years

Scenario # 1

New home – only one AAV used in the entire plumbing system - @ K.S.

Contractor has tried every type of AAV, but the AAVs “chatter” all day long.

What is the causing the issue?

Scenario #2

5 different homes in a development with the same issue – 2 lavatories with AAVs in bathroom, WC won't flush correctly. When AAV is removed, WC flushes with no issues.

What is causing the issue ?

Just think about those two scenarios, we will return to it later for comments/solutions



Applying Definitions

The “Building Blocks” of knowledge are within the code.

What exactly do I mean by building blocks?

Well, I’m glad you asked



What is the base building block of knowledge?



Wait for it.....

DEFINITIONS!

Applying Definitions

Definitions are the building blocks for all knowledge!

Without the “base” common knowledge provided through definitions, you cannot reasonably apply the intent of the code.



Italicized words are road signs pointing back to the definitions

In laying out the model codes, ICC understood that the building blocks have to be in place. Without a solid foundation, the knowledge in the codes will crumble much like a building would.



Applying Definitions

Or just as bad, our views or understanding of the code can become *SLANTED*

Without the road signs pointing us back to the knowledge base, we can (and often do!) lose sight of the true intention or meaning in different code sections.



Some agencies have failed to realize the importance of keeping those “road signs” intact

2017 OPC

- **914.1 Circuit vent permitted.** A maximum of eight fixtures connected to a horizontal branch drain shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream fixture drain connection to the most upstream fixture drain connection to the horizontal branch.

2015 ICC

- **914.1 Circuit vent permitted.** A maximum of eight fixtures connected to a horizontal branch drain shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream fixture drain connection to the most upstream fixture drain connection to the horizontal branch.

Applying Definitions

Which Way Do We Go ?

Because the State of Ohio has removed the “road signs”, it is imperative that we all remind ourselves to go back often and review the definitions. This makes a huge difference in interpretation.



Example

In the following slides I will show you how, when we transferred to the base model codes, the proper foundation wasn't applied when designers, inspectors, contractors and installers were educated regarding this new code compared with what they were previously using.

Applying Definitions

Example

Year – 2000

New Single Family Home is Constructed.

Plumbing Fixtures on the 1st floor include;

- Kitchen Sink
- Automatic Clothes Washer Standpipe
- ½ bath (W.C. & Lav)
- Individual shower unit (located in mud room)

Example (continued)

Plumbing Fixtures on the 2nd floor include;

- Common/Hall Full Bath (W.C., Lav, Tub/Shower)
- Master Bath (corner Whirlpool Tub, Shower compartment, W.C., 2- Lavatories)

Typical master bath configuration.

Applying Definitions

1st Floor

- K.S. - individually vented
- AWC – Individually vented
- Shower – Individually vented
- ½ bath – Horizontal Wet Vent

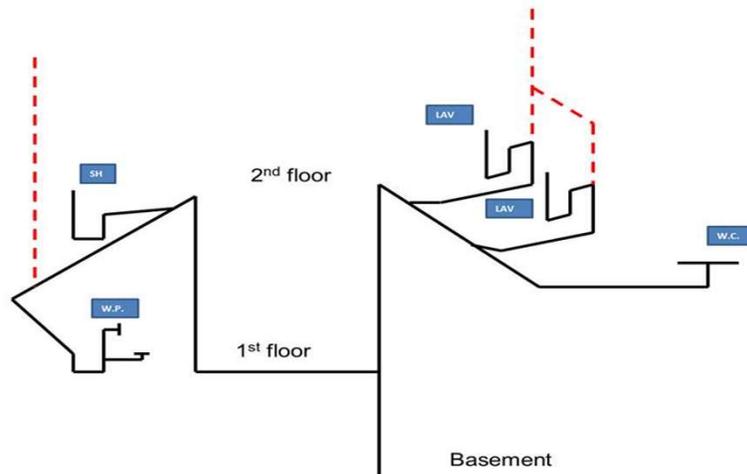
All code compliant, all function properly.

2nd Floor

- Common/Hall Bath – Horizontal Wet Vent System
- Master Bath – YOU determine what is going on.

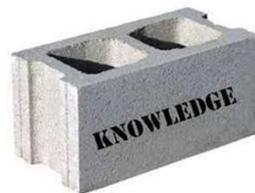
Applying Definitions

Master Bath Piping Configuration

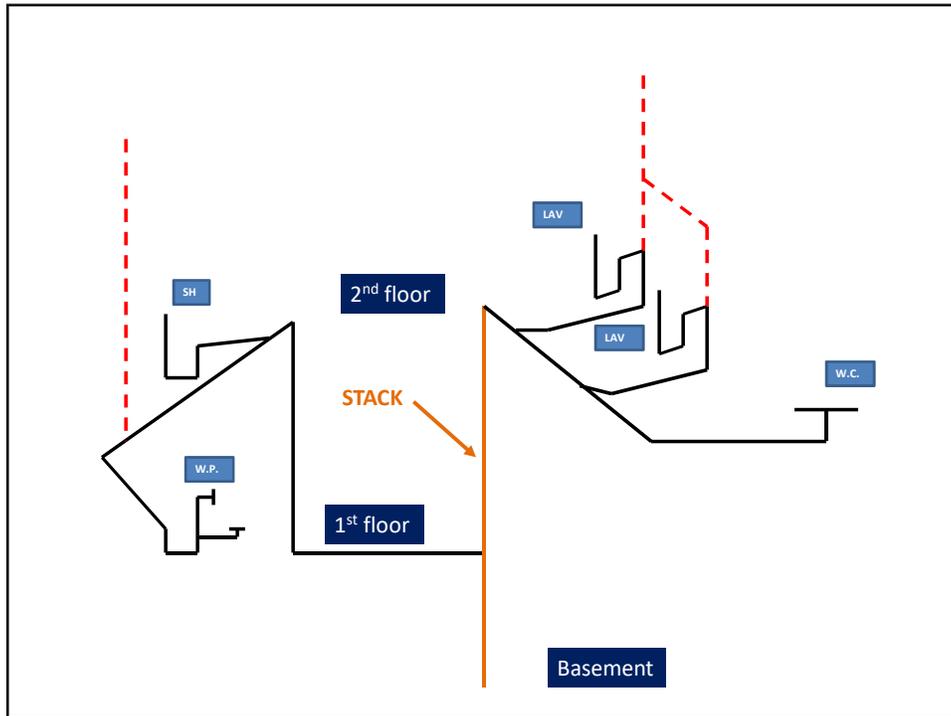


HINT

Remember to apply the definitions!

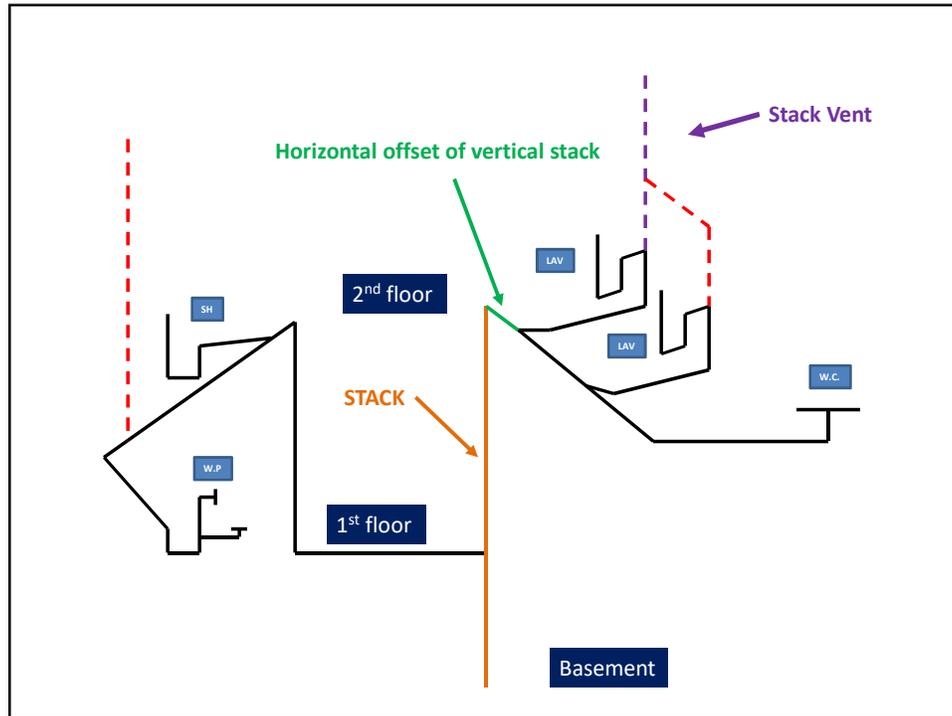


Applying Definitions



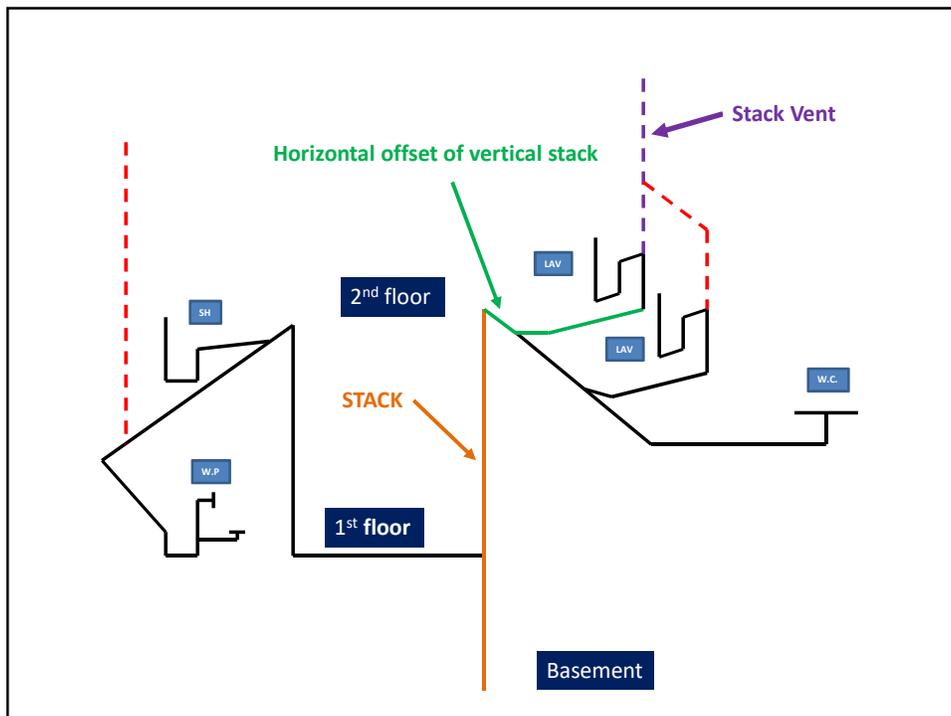
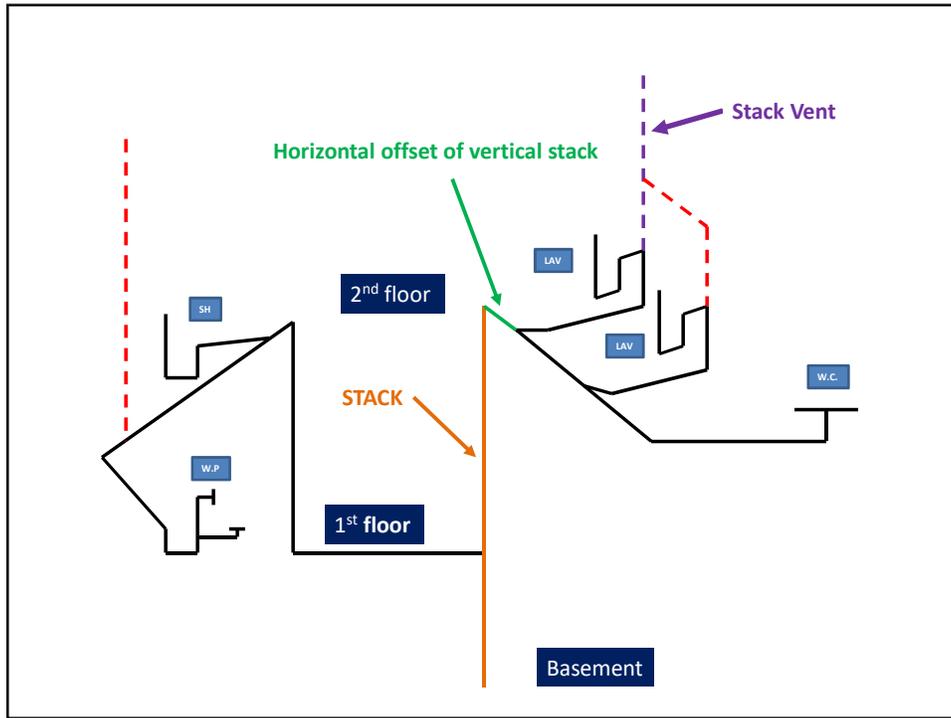
STACK. A general term for any vertical line of soil, waste, vent or inside conductor piping that extends through at least one story with or without offsets.

Applying Definitions

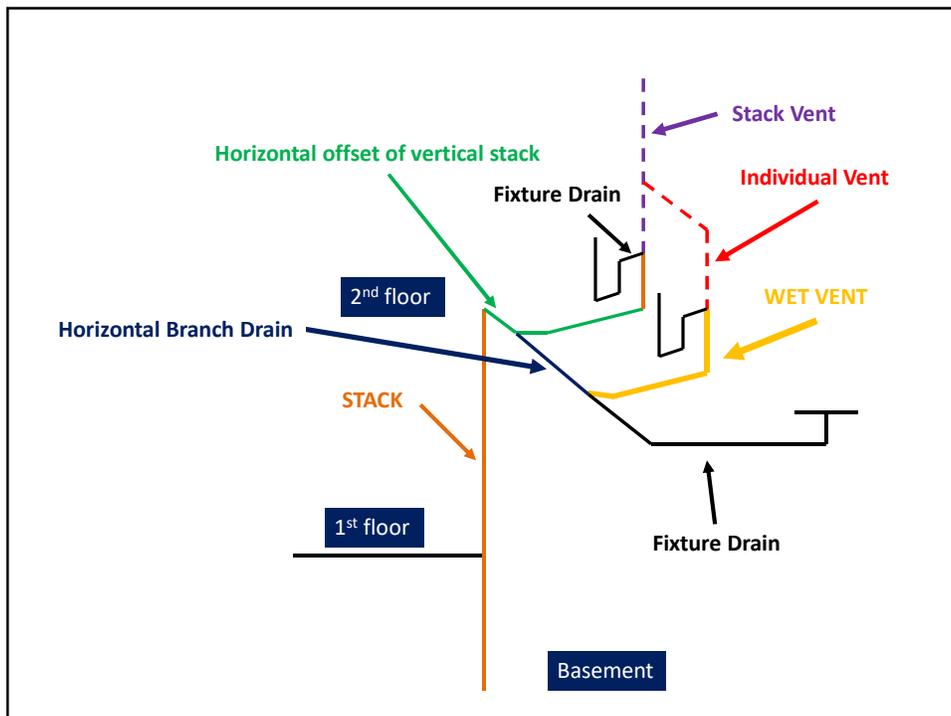
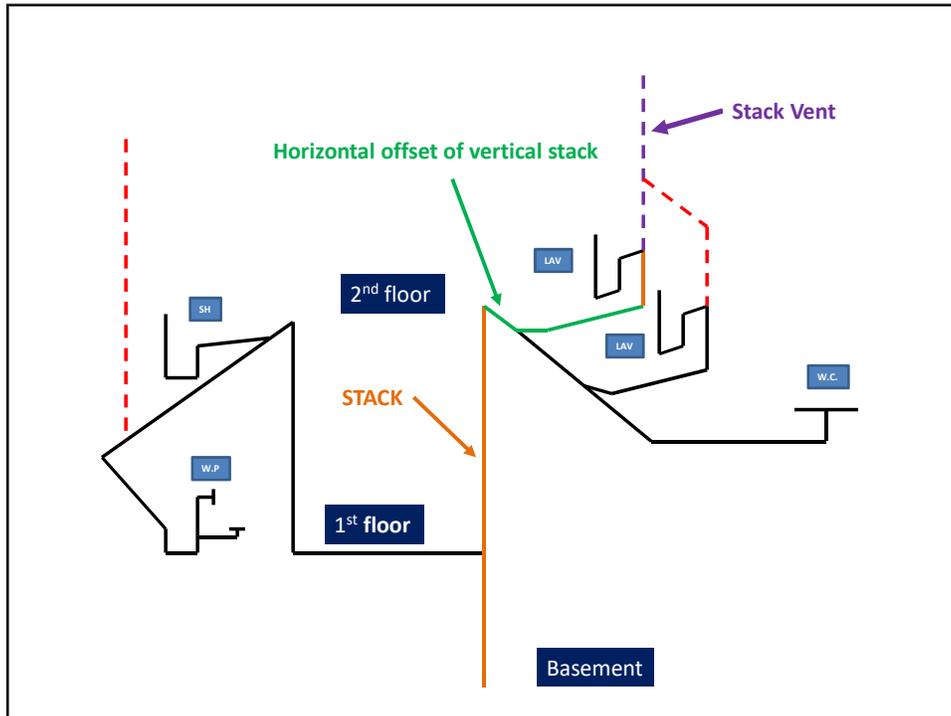


STACK VENT. The extension of a soil or waste stack above the highest horizontal drain connected to the stack

Applying Definitions



Applying Definitions

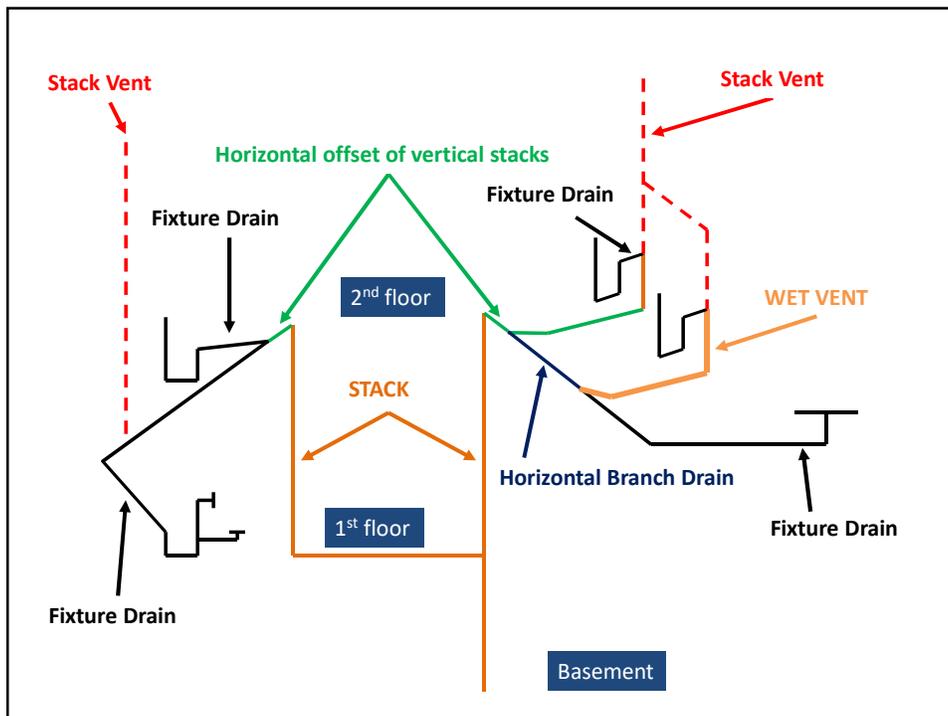
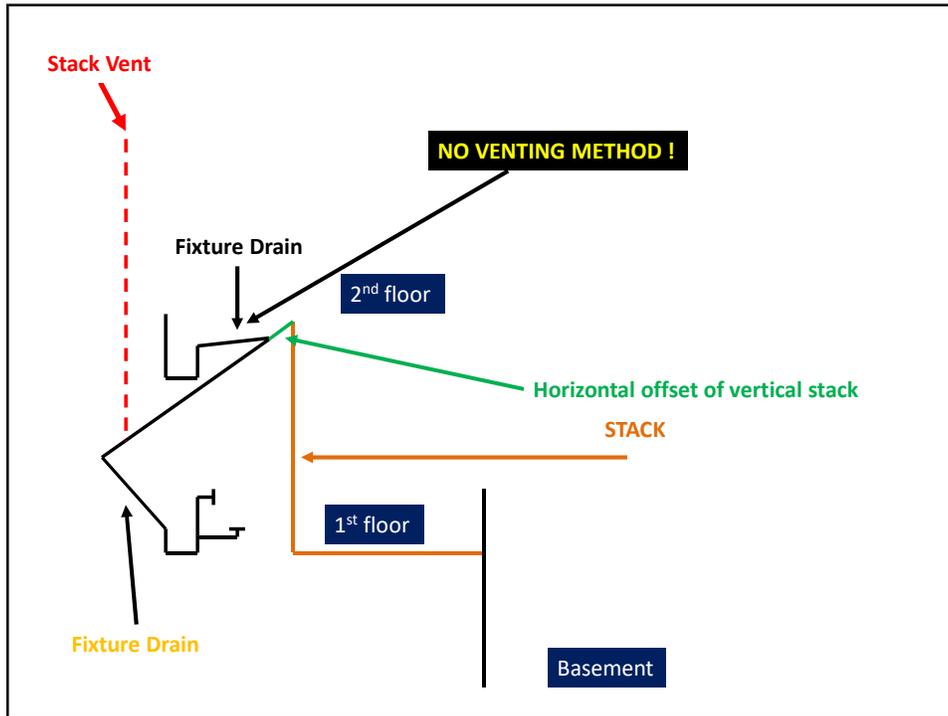


Applying Definitions

HORIZONTAL BRANCH DRAIN. A drainage branch pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, that receives the discharge from **two** or more fixture drains or branches and conducts the discharge to the soil or waste stack or to the building drain.

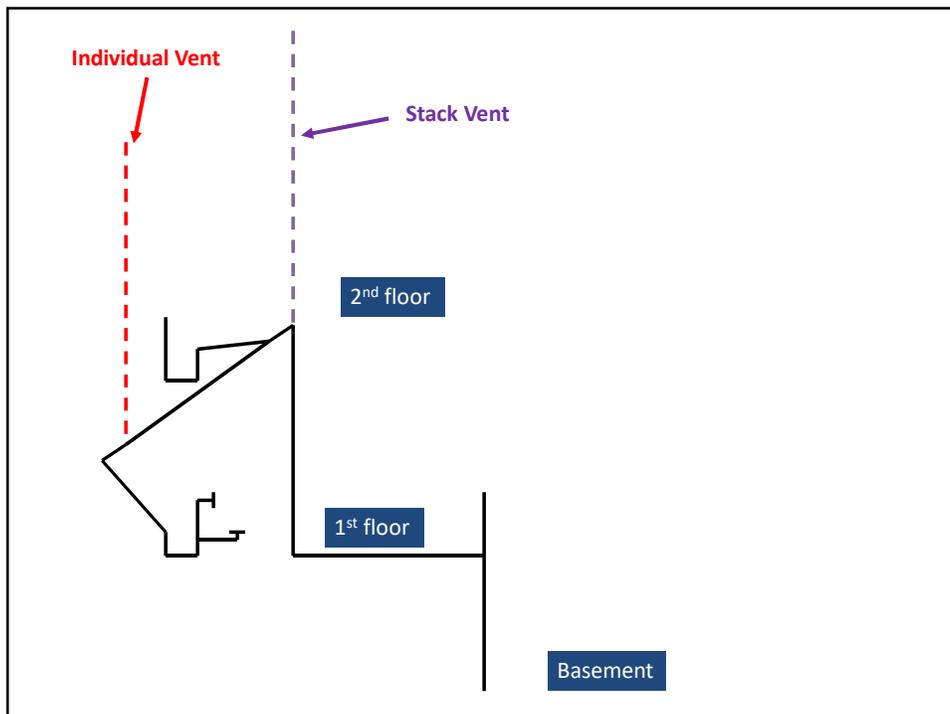
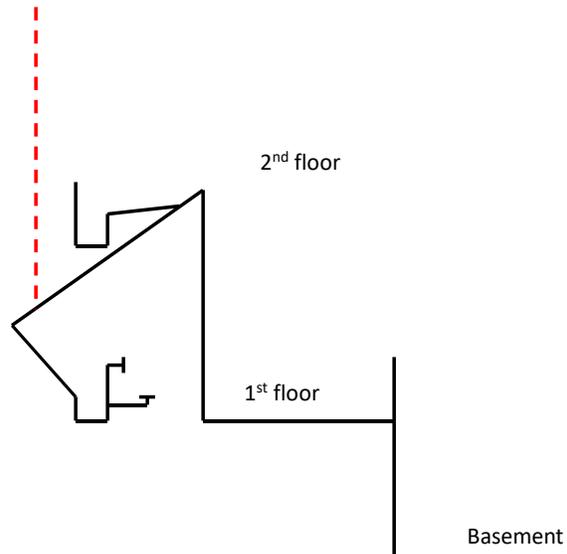
912.1 Horizontal wet vent permitted. Any combination of fixtures within two ***bathroom groups*** located on the same floor level is permitted to be vented by a horizontal ***wet vent***. The ***wet vent*** shall be considered the vent for the fixtures and shall extend from the connection of the dry vent along the direction of the flow in the drain pipe to the most downstream fixture drain connection to the ***horizontal branch drain***. Each wet-vented ***fixture drain*** shall connect independently to the horizontal ***wet vent***. Only the fixtures within the ***bathroom groups*** shall connect to the wet vented ***horizontal branch drain***. Any additional fixtures shall discharge downstream of the horizontal ***wet vent***.

Applying Definitions

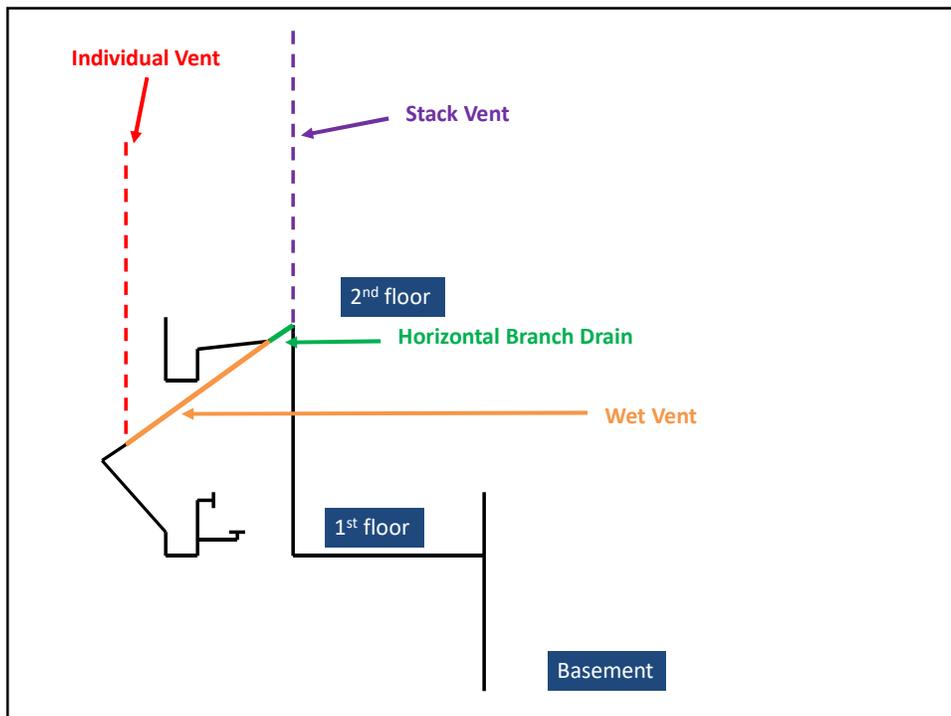
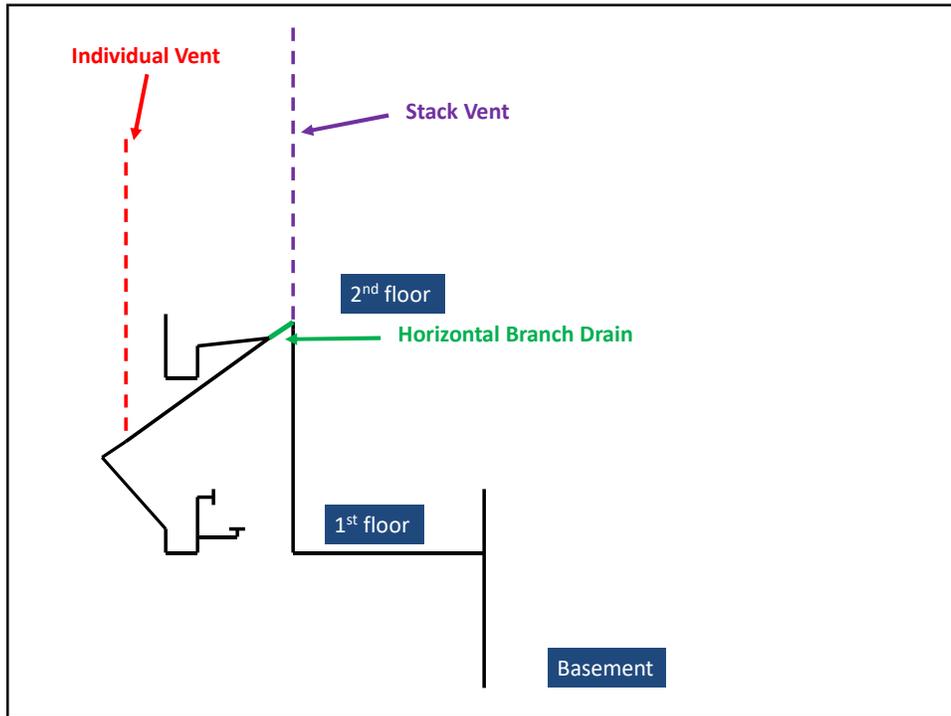


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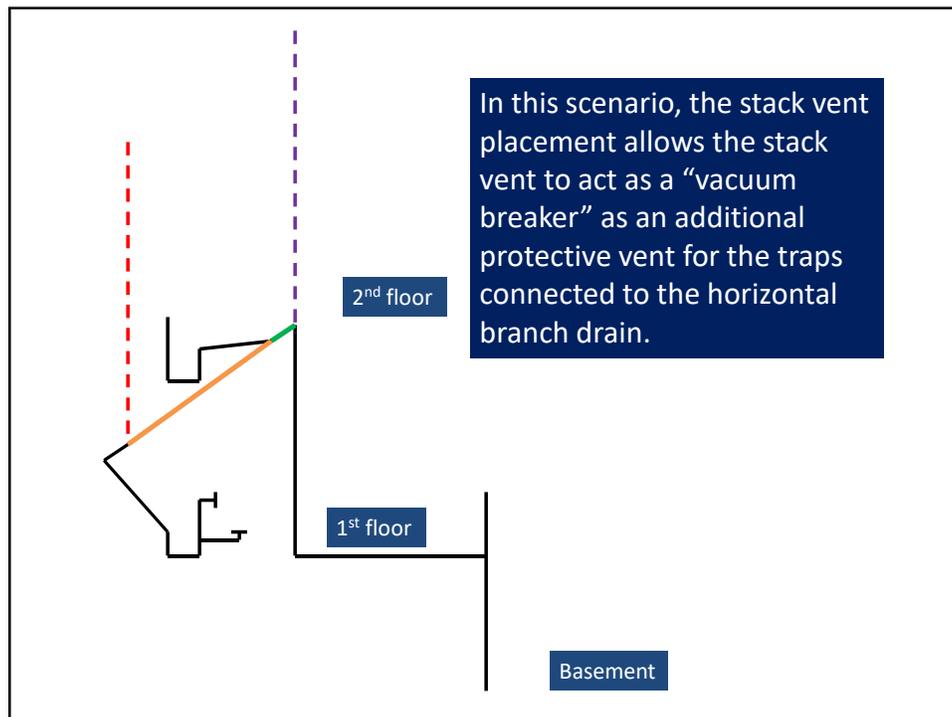
How can we make this a compliant installation ?



Applying Definitions



Applying Definitions



Previous model code versions included within the venting chapter a requirement that all *stacks* were to be provided with a *stack vent*. This section was removed because it was felt that it was redundant since by *DEFINITION*, every *stack* will have a *stack vent*.

As shown in the previous slides, that has often been overlooked or in general not properly conveyed in apprenticeship programs and contractor CEU classes.

Applying Definitions

Remember This ?

Scenario # 1

New home – only one AAV used in the entire plumbing system - @ K.S.

Contractor has tried every type of AAV, but the AAVs “chatter” all day long.

What is the causing the issue?

Scenario #2

5 different homes in a development with the same issue – 2 lavatories with AAVs in bathroom, WC won't flush correctly. When AAV is removed, WC flushes with no issues.

What is causing the issue ?

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Applying Definitions

Scenario # 2



5 different homes in a development with the same issue – 2 lavatories with AAVs in bathroom, WC won't flush correctly. When AAV is removed, WC flushes with no issues.

What is causing the issue ?

Scenario # 1 & 2

The issues are caused by several factors.

1. The City of Columbus has a very extensive sewer system.
2. Historically, sewer purveyors have counted on the buildings to vent the public sewers.
3. The State of Ohio shifted to a "model code" which allowed for smaller vent pipes.
4. Due to rain water infiltration at sewer manhole covers, the EPA mandated that all new and replacement manhole covers have seals to prevent water infiltration.
5. The base model codes have not taken these factors into consideration when the codes were written and/or revised.

Applying Definitions

So.... What Exactly Does That Mean?

Factor # 1

This my friends is where a basic science lesson comes in;

If we take an empty glass.....



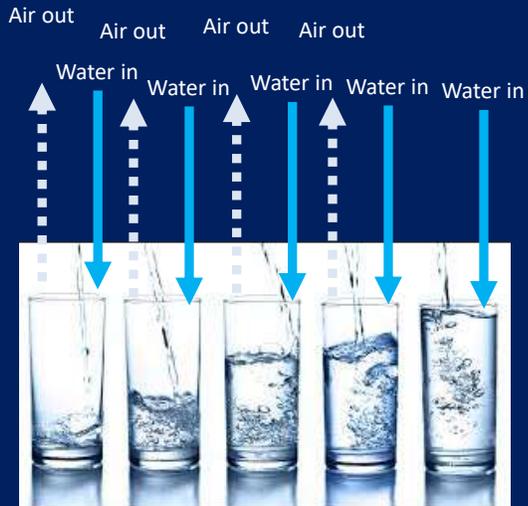
Then fill it with water...



What have we actually done ?

Applying Definitions

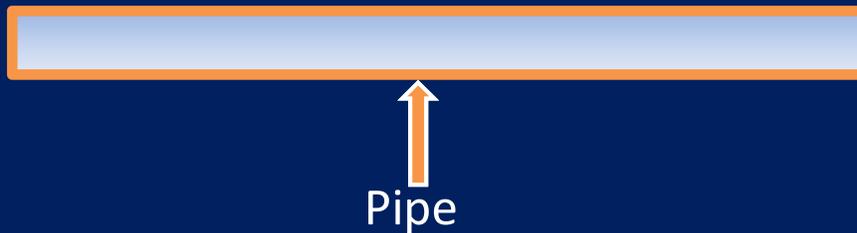
We have displaced the air



The same thing happens in the
sanitary plumbing network

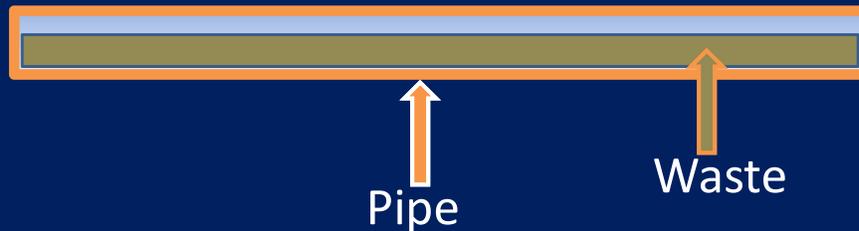
Is the pipe empty ?

No, it is full of air!



Applying Definitions

The pipe has the same amount of space occupied, some space is occupied by air and some by waste. The air that occupied the space previously doesn't just disappear, it has to go somewhere.



Factor # 1

1. The City of Columbus has a very extensive sewer system.

Given the basic scientific principles we covered, it is reasonable to assume that no public sewer system can remain in a neutral pressure state.

Applying Definitions

Factor # 2

2. Historically, sewer purveyors have counted on the buildings to vent the public sewers.

Sewers, just like building sanitary systems must have a method of relieving positive and negative pressures.

Factor # 3

3. The State of Ohio shifted to a “model code” which allowed for smaller vent pipes.

Prior codes required a “full size” vent to atmosphere. This allowed the free movement of air in and out of the systems.

Applying Definitions

Factor # 4

4. Due to rain water infiltration at sewer manhole covers, the EPA mandated that all new and replacement manhole covers have seals to prevent the water infiltration.

The EPA doesn't care how their rules affect the operation of the building plumbing or the purveyors sewer system. Their concern is to ensure the waste is properly treated before it is discharged to the public waterways.

Factor # 5

5. The base model codes have not taken these factors into consideration when the codes were written and/or revised.

It appears much of the "model code" regarding venting may have been based on a research paper published by the ASPE Research Foundation, authored by Edward Brownstein. The problem is this publication is based on 1950s, 1960s, and 1970s research publications. These design assumptions were employed prior to the current EPA rules.

Applying Definitions

So....Scenario # 1

New home – only one AAV used in the entire plumbing system - @ K.S.

Contractor has tried every type of AAV, but the AAVs “chatter” all day long.

What is the causing the issue?

The building is located toward the farthest end of the public sewer. The public sewer has a constant state of negative pressure due to the miles of waste dumping in ahead of this building. The first place the sewer can find air is at the AAV on the K.S. The AAV can't pass enough air to satisfy the demand.

Scenario # 2

The public sewer is in a constant state of positive pressure. Since AAVs only open when a negative pressure is exerted upon them, they cannot open in this scenario.

This basically means the fixtures have no venting method.

5 different homes in a development with the same issue – 2 lavatories with AAVs in bathroom, WC won't flush correctly. When AAV is removed, WC flushes with no issues.

What is causing the issue ?

Applying Definitions

With the reduced venting allowed in the code, the minimum size vent went from 3 inch down to 2 inch, or in some cases 1-1/2 inch. Even a 2 inch vent has less than half of the available venting area compared to a 3 inch pipe. Couple that with the sealed manholes mandated by the EPA, it doesn't seem feasible that a "neutral" pressure will be maintained in the public sanitary sewer system.



2 inch Pipe

3.14 sq. inches
of venting area



3 inch Pipe

7.065 sq. inches
of venting area

Applying Definitions

Obviously further study will need to be done. Until then, design professionals, contractors and installers will have to give careful consideration to their designs. Unless we separate the sewer pressures from the building sanitary system, we will continue to experience these unforeseen issues.

Two Possible Preventative Measures

1

Use a monometer to sample the sewer pressure before deciding to use an AAV.

2

Place a backwater valve so it serves the entire building, and place a backwater valve to serve any fixtures below the next upstream manhole.